



PATENT

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF APPEALS AND INTERFERENCES**

Application No. : 10/591,607
Confirmation No. : 3404
Applicant : Sergej Lopatin
Filed : July 17, 2007
Title : Apparatus for determining and/or monitoring a
process variable
TC/A.U. : 2837
Examiner : B. P. Gordon
Docket No. : LOPA3010/FJD
Customer No. : 23364

BRIEF ON APPEAL

Commissioner for Patents
P.O. Box 1450
Alexandria, VA. 22202-3514

Sir:

INTRODUCTORY COMMENTS

Pursuant to the provisions of 37 CFR 41.37, submitted herewith is Applicant/Appellant's Brief on Appeal along with the required fee.

Any additional fees necessary for this appeal may be charged to the undersigned's Deposit Account No. 02-0200.

REAL PARTY IN INTEREST

(37 CFR 41.37(c)(1)(i))

The real party in interest is Applicant/Appellant's assignee Endress + Hauser GmbH + Co. KG. The assignment was recorded on July 17, 2007 at Reel 019600 and Frame 0413.

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RELATED APPEALS AND INTERFERENCES

(37 CFR 41.37(c)(1)(ii))

There are no related appeals or interferences with respect to the invention defined in this application.

STATUS OF CLAIMS

(37 CFR 41.37(c)(1)(iii))

Claims 1 - 7 and 9 have been cancelled.

Claims 8 and 10 - 14 are pending in this application.

Claims 8 and 10 - 14 have been finally rejected.

STATUS OF AMENDMENTS

(37 CFR 41.37(c)(1)(iv))

No amendment or response was filed after issuance of the Office Action of January 28, 2010, except for the Notice of Appeal filed on June 28, 2010.

SUMMARY OF CLAIMED SUBJECT MATTER

(37 CFR 41.37 (c)(1)(v))

(References are to page and line of the specification)

The present invention relates to an apparatus for determining and/or monitoring a process variable of a medium. (pg. 1, lines 4 and 5) .

The apparatus includes an oscillatable unit secured to a membrane, and a sending/receiving unit, which excites the membrane and the oscillatable unit to oscillate, and receives the oscillations of the oscillatable unit, with the sending/receiving unit comprising a disk-shaped, piezoelectric element. (pg. 1, lines 5 - 9). The apparatus further includes a control/evaluation unit, which monitors and/or determines the process variable on the basis of the oscillations

of the oscillatable unit. (pg. 1, lines 9 - 12).

The disk-shaped piezoelectric element has at least two segments, which are polarized essentially oppositely to one another, and on the side of the disk-shaped piezoelectric element facing away from the membrane, at least two electrodes of opposite polarity are applied. (pg. 3, lines 6 - 10). The polarity is essentially perpendicular to the membrane. (pg. 3, lines 11 - 12).

According to a preferred embodiment, there is provided an oscillating unit 1, which is embodied in the form of a tuning fork including two oscillatory rods 3 and 4 secured to a membrane 5. A sending/receiving unit 6 causes the membrane 5 to oscillate with a predetermined transmitting frequency. (pg. 5, lines 13 - 20). Control is achieved by a control/evaluation unit 10. (pg. 6, lines 6 and 7).

As shown in Fig. 2, the piezoelectric element 15 has segments 18, and on top of the segments, on the side of the piezoelectric element 15 facing away from the membrane are situated electrodes 20. Which have different polarity. The side 17 of the piezoelectric element 15 facing toward the membrane can be connected electrically conductively with the housing and, thus, with ground, or, when a galvanic separation is necessary, also an insulating layer can be placed between the piezoelectric 15 and the membrane 5. (pg. 6, lines 9 - 21).

There is including only one independent claim, claim 8. For mapping purposes, only claim 8 will be mapped.

8. An apparatus for determining and/or monitoring a process variable of a medium (pg. 1, lines 4 and 5), comprising:

a membrane (pg. 3, line 9);

an oscillatable unit (pg. 1, line 5) secured to said membrane (pg. 1, line 6);

a sending/receiving unit (pg. 1, line 6), which excites said oscillatable unit to oscillate and which receives oscillations of said oscillatable unit (pg. 1, lines 6 - 8);

a control/evaluation unit (pg. 1, line 10), which, on the basis of the oscillations of said oscillation unit, monitors and/or determines the process variable (pg. 1, lines 10 and 11), wherein:

said sending/receiving unit comprises a disk-shaped, piezoelectric element (pg. 1, lines 8 and 9);

said disk-shaped, piezoelectric element has two segments, which are essentially polarized oppositely to one another (pg. 3, lines 6 - 8);

said two segments of said disk-shaped, piezoelectric element are connected in series (pg. 3, line 17);

exactly two electrodes of opposite polarity are applied to the side of said disk-shaped, piezoelectric element (pg. 3, lines 25 and 26); and

said exactly two electrodes of opposite polarity are applied to said disk-shaped, piezoelectric element facing away from said membrane (pg. 3, lines 26 and 27).

GROUND OF REJECTION TO BE REVIEWED ON APPEAL
(37 CFR 41.37(c)(1)(vi))

(1) Claims 8, 10, 11, 13 and 14 are finally rejected under 35 USC 103(a) over Brutschin in view of Lopatin.

(2) Claim 12 is finally rejected under 35 USC 103(a) over Brutschin in view of Lopatin and Lewiner.

These rejections were, and for the record on this appeal. Respectfully traversed.

ARGUMENTS

(37 CFR 41.37(c)(1)(vii))

(1)

Brutschin and Lopatin are not combinable as a result of any teaching found in either reference

The combination of Brutschin and Lopatin would not, it is respectfully submitted, lead to the apparatus of the presently claimed invention, as the behavior of the piezoelectric elements under an AC voltage does not coincide with the behavior of the present invention. Lopatin does not disclose the same piezoelectric element with electrodes as is disclosed in the present invention. The electrodes are provided differently and the voltage is applied differently. The consequence is a totally different movement of the piezoelectric element. See the discussion of Brutschin and Lopatin in the RESPONSE filed on October 1, 2009. As was noted there:

“The piezoelectric element according to the present invention does not experience or perform push and pull forces. The two segments are connected in series and contract and expand synchronously. The principle of excitation of the membrane and the oscillatable unit that is secured to the membrane therefore differs very significantly from the one disclosed by Lopatin. This can clearly be seen by comparing e.g. Fig. 15 of Lopatin and Fig. 2 of the present invention, both showing the two rods of a tuning fork and the piezoelectric drive. While Lopatin provides two drives, one for each rod, the invention needs only one drive, placed in the center of the membrane in the middle of the two rods.”

Lopatin does not even suggest the single drive of the present invention - the piezoelectric element and the electrodes including the voltage supplied to them. Therefore, it is respectfully submitted, that it cannot be obvious to a person skilled in the art knowing Brutschins and Lopatins apparatuses to conclude that the movement achieved by the present invention can be achieved by the combination proposed..

The attached drawings schematically show the piezoelectric elements and the

electrodes applied to them for Brutschin and Lopatin, as well as the present invention.. Also shown is the deformation of the piezoelectric element when voltage is applied to the electrodes attached to it. The deformed piezoelectric element is displayed in blue color, as well as the arrows indicating the direction of deformation. The alternating voltage supplied is indicated by $+E/-E$. As the electrodes are supplied with an alternating voltage, each of the drawings is divided into two drawings, wherein the first drawing shows the voltage induced deformation of the piezoelectric element during a first period (period 1) and the second drawing shows the deformation during a second period (period 2), when the electrodes are supplied with opposite voltage compared to period 1.

Fig. 1 shows a plan view of the four-segmented piezoelectric element disclosed by Brutschin. The cross-sectional view would look similar to the one shown in Fig. 1a, with the difference that the piezoelectric element would be rotated through 45° around its symmetry axis. As there are separate driving segments and receiving segments only the two quarters of the circular element to which sending electrodes are applied move as a response to the voltage supplied to the electrodes. The two sending segments are of opposite polarity. The other two segments move in response to the movement of the oscillating unit the piezoelectric element is secured to. If during period 1 the two sending segments are supplied with displayed voltage they contract towards the center of the circular piezoelectric element synchronously, while the remaining two segments expand. During period 2 the sending segments expand outwards while the remaining two segments contract. The resulting shape is elliptical, wherein the ellipse switches its orientation through 90° as voltage switches polarity.

Fig. 2a shows a cross-sectional view of the piezoelectric element as taught by Lopatin. One of the surfaces of the piezoelectric element is covered completely with an electrode of a first polarity. The other surface is also covered completely with an electrode, that electrode having a second polarity which is opposite to the first one. The two segments are oppositely polarized and form sending and receiving units at the same time. The reaction of the two segments to the applied voltage is different. While the left segment expands, the right segment contracts and vice versa.

Fig. 2b displays the corresponding plan view of the piezoelectric element. During period 1 the positive polarized segment contracts in a direction perpendicular to the axis that separates the two segments, while the negative polarized segment expands in the same direction. Along said axis the position and diameter of the piezoelectric element remains the same.

Fig. 3 shows the piezoelectric element and electrodes according to the present invention. The piezoelectric element is divided into two segments of opposite polarity, as indicated by the black arrows. On one of the two surfaces a conductive coating is provided. This is the surface facing the membrane. The coating can be connected with ground, but this does not necessarily have to be the case. To the other surface - the surface facing away from the membrane - two electrodes are applied. These electrodes are not connected with one another, but are of opposite polarity.

Fig. 3a shows a cross-sectional view of the circular piezoelectric element and the deformation in a direction perpendicular to the surface of the piezoelectric element. During period 1 positive voltage is applied to the positive polarized segment on the left and negative voltage is applied to the negative polarized segment on the right. During period 2 the two segments are supplied with the opposite voltage. As can be seen the two segments expand and contract synchronously along the direction of polarization.

Fig. 3b shows a plan view of the piezoelectric element and the deformation in directions laying in planes parallel to the surface. If positive voltage is applied to the positive polarized segment, while the negative polarized segment is provided with a negative voltage, the whole piezoelectric element contracts in radial direction towards the center of the circular piezoelectric element, that is the diameter decreases. If opposite voltages are applied, the diameter increases, correspondingly. The two electrodes do not cover the whole piezoelectric element, but are separated through a small gap as isolation. Because of this gap the resulting shape slightly deviates from a circle, as the part of the piezoelectric element not covered with electrodes expands or contracts less than the rest. This effect is displayed exaggeratedly. Expansion and contraction in radial direction are basically uniform.

This uniform expansion and contraction is what is needed for driving the oscillating unit of applicant's apparatus. The segments are both sending and receiving segments.

Considering the drawings it can be concluded that a combination of the behavior shown in Fig. 1 with the behavior shown in Fig. 2 are in no way compatible and does not result in the desired behavior shown in Fig. 3. Therefore, the inventive apparatus is neither anticipated nor obvious over Brutschin in view of Lopatin. See, *In re Benno*, 226 USPQ683 (Fed. Cir 1985). A reference provides a teaching for what it discloses but also for what it suggests. Here the suggestion, if any exists, does not lead to obviousness. See, *In re Baird*, 29 USPQ2d 1550 (Fed. Cir. 1994).

It is not clear what a combination of Brutschin and Lopatin should look like. An essential feature of Brutschin's device is the strictly separated sending segments for driving the oscillatable unit and receiving segments for receiving signals from the oscillatable unit. In contrast, Lopatin teaches a piezoelectric element having only two segments which are not divided into sending and receiving segments. The two segments are oppositely polarized, as are the two sending segments disclosed by Brutschin. But different to Brutschin's piezoelectric element shown in Fig. 2 the surfaces of the piezoelectric element as taught by Lopatin are each covered completely with only one electrode. In other words, both surfaces have to be contacted and supplied with a voltage.

There is no hint as to how a person skilled in the art should use the advantage of having only two segments without losing the advantage of having to contact only one of the surfaces and moreover resulting in the desired behavior of the piezoelectric element for driving the oscillatable unit, as this behavior is neither achieved by Brutschin nor by Lopatin.

Referring to the examiner's statement, that Lopatin would describe the apparatus claimed by the applicant in paragraph 15 of the published application, it should again be explained why this is not the case. Paragraph 15 teaches that the

electrode attached to the exterior surface of the piezoelectric drive - i.e. one of the surfaces of a piezoelectric element arranged with a second piezoelectric element in a stack - can also consist of two electrodes, wherein each of the electrodes is attached to one of the segments. In principle the stack can also be substituted by only one piezoelectric element - although this would apparently lead to a loss in force for driving the oscillatable unit. But as soon as the electrodes are connected with a voltage supply, e.g. via wires, the assemblies differ. Consider the following:

- 1) In lines 19-21 of the same paragraph [15] Lopatin teaches that if one of the electrodes is split into two electrodes, these two electrodes are electrically connected to one another. In other words, the two electrodes have the same polarity. In contrast, pending claim 8 of the present invention clearly states that the two electrodes applied to a common side of the piezoelectric element are of opposite polarity; and
- 2) Lopatin applies opposite voltage to the two surfaces of a piezoelectric element, whereas only one side of the piezoelectric element disclosed by the present application is contacted. The second side - the one facing the membrane - can voluntarily be provided with a conductive coating and connected to ground.

Hence, the embodiment comprising two electrodes instead of one common electrode attached to one of the surfaces is only a technical modification which does not change anything on the physical behavior of the piezoelectric drive or element, as the two electrodes are electrically connected with one another. Of course it does not make any difference if the two segments are provided with a voltage via a common electrode or if they are contacted via two separate electrodes which receive the same voltage.

It is true that in a combination the motivation need not be expressly articulated. But in applying, or looking for motivation, one must use "common sense," *KSR International v. Teleflex, Inc.* 82 USPQ2d 1385 (Sup. Ct. 2007).

Why would one use one driver when the proposed design uses two? That question must be answered from a consideration of the references. If it is not, then obviousness fails.

(2)

Lewiner adds very little to the combination of Brutschin and Lopatin, and certainly not enough for obviousness

Lewiner is cited for its teaching of electrodes. It is not relied upon for a teaching that would support the combination of Brutschin and Lopatin. Accordingly, the defect in the combination of Brutschin and Lopatin, as noted above, remains so that the combination of Brutschin and Lopatin still cannot prevent the patentability of claims 8 and 10 - 14.


CONCLUSION

In view of the above, it is respectfully submitted that claims 8 and 10 - 14 should be allowed over the references of record and those applied.

Date: August 31, 2010

Respectfully submitted

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APPENDIX OF CLAIMS
(37 CFR 41.37 (c)(1)(viii))

Claims 1 - 7 (Cancelled).

8. An apparatus for determining and/or monitoring a process variable of a medium, comprising:

a membrane;

an oscillatable unit secured to said membrane;

a sending/receiving unit, which excites said oscillatable unit to oscillate and which receives oscillations of said oscillatable unit;

a control/evaluation unit, which, on the basis of the oscillations of said oscillatable unit, monitors and/or determines the process variable, wherein:

said sending/receiving unit comprises a disk-shaped, piezoelectric element;

said disk-shaped, piezoelectric element has two segments, which are essentially polarized oppositely to one another;

said two segments of said disk-shaped, piezoelectric element are connected in series;

exactly two electrodes of opposite polarity are applied to the side of said disk-shaped, piezoelectric element; and

said exactly two electrodes of opposite polarity are applied to said disk-shaped, piezoelectric element facing away from said membrane.

Claim 9 (Cancelled).

10. The apparatus as claimed in claim 8, wherein:

said electrodes have essentially the same shape.

11. The apparatus as claimed in claim 10, wherein:

said electrodes have the shape of semicircular segments.

12. The apparatus as claimed in claim 8, wherein:

said electrodes are so structured and arranged that they annularly surround themselves.

13. The apparatus as claimed in claim 8, wherein:

said piezoelectric element is provided on the side facing said membrane at least partially with a conductive coating.

14. The apparatus as claimed in claim 8, wherein:

the side facing said membrane is connected electrically conductively with ground.

EVIDENCE APPENDIX

There is no evidence being relied upon which was submitted pursuant to 37 CFR 1.130, 1.131 or 1.132.

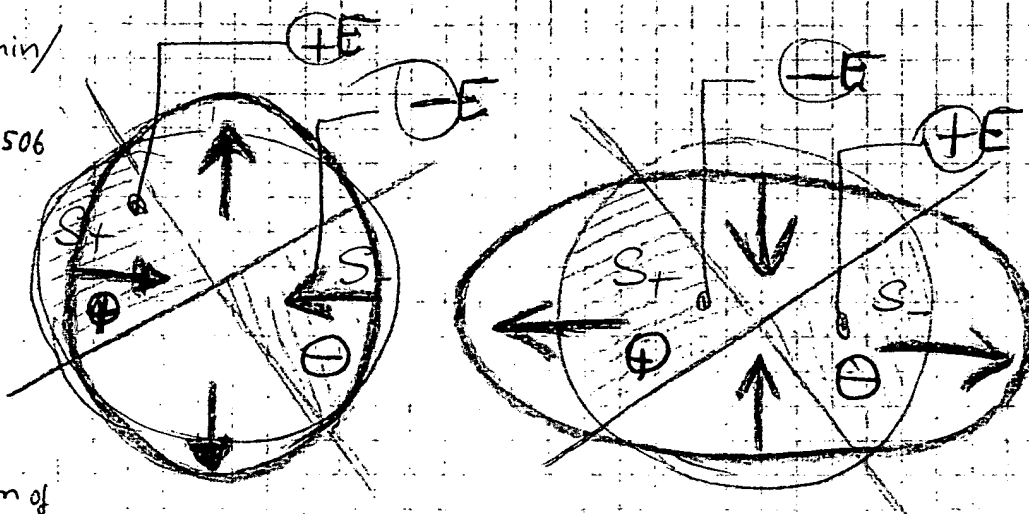
RELATED PROCEEDINGS APPENDIX

There is no related proceeding being relied upon.

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① Brutschin/

Pub. no.
US 2003/0159506



polarization of
segments indicated
by '+' and '-'

Period 1

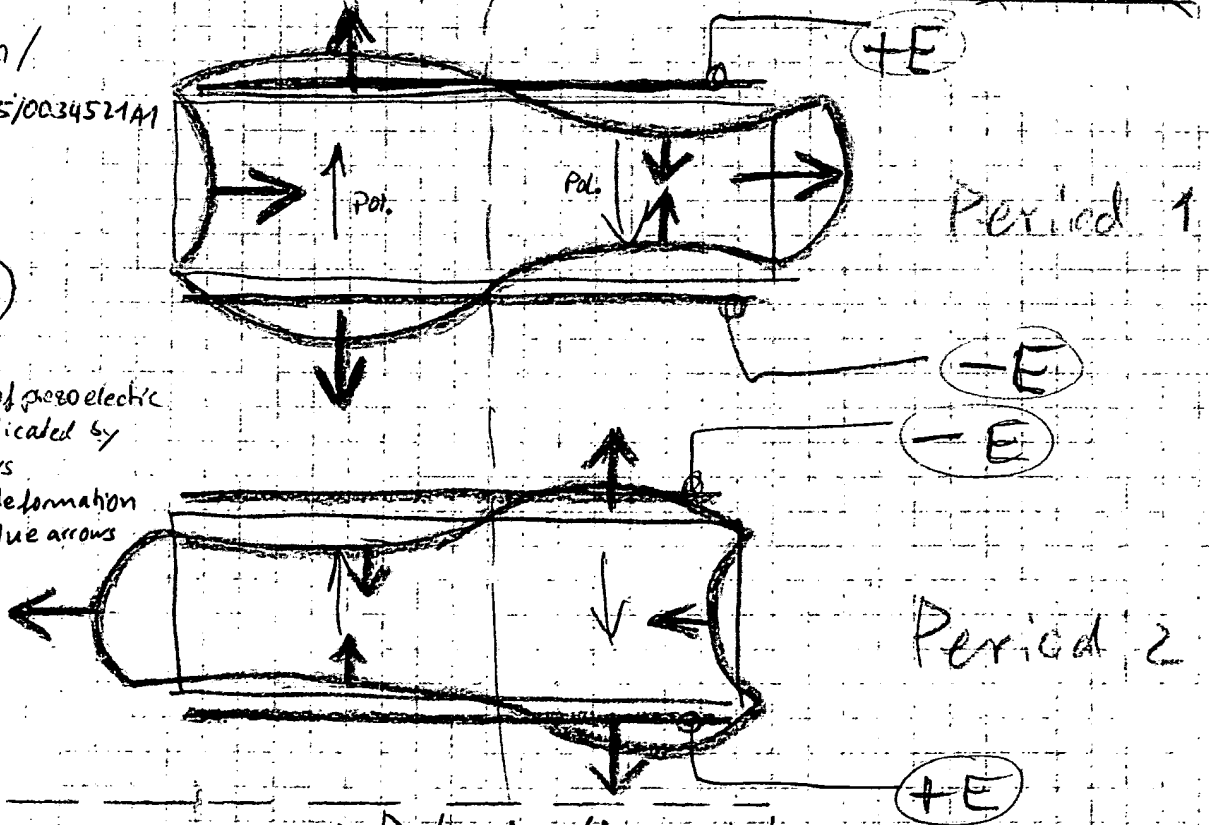
Period 2

② Lopatin/

Pub. no. 2005/0034521A1

(a)

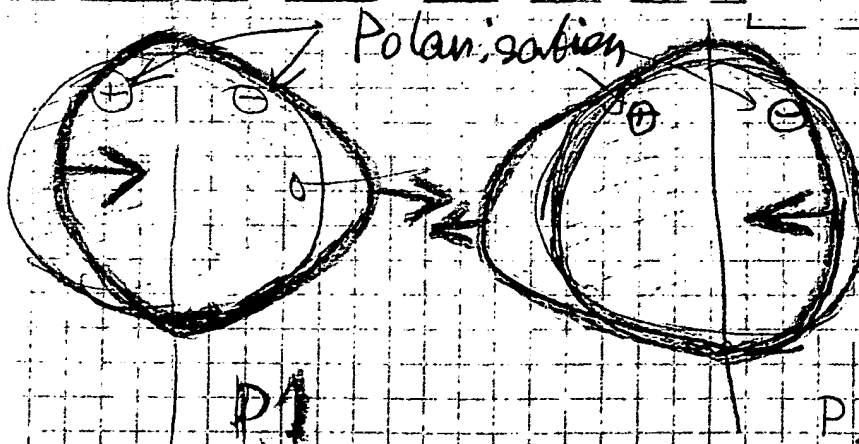
polarization of piezoelectric
element indicated by
black arrows
direction of deformation
indicated by blue arrows



Period 1

Period 2

(b)



Polarisation

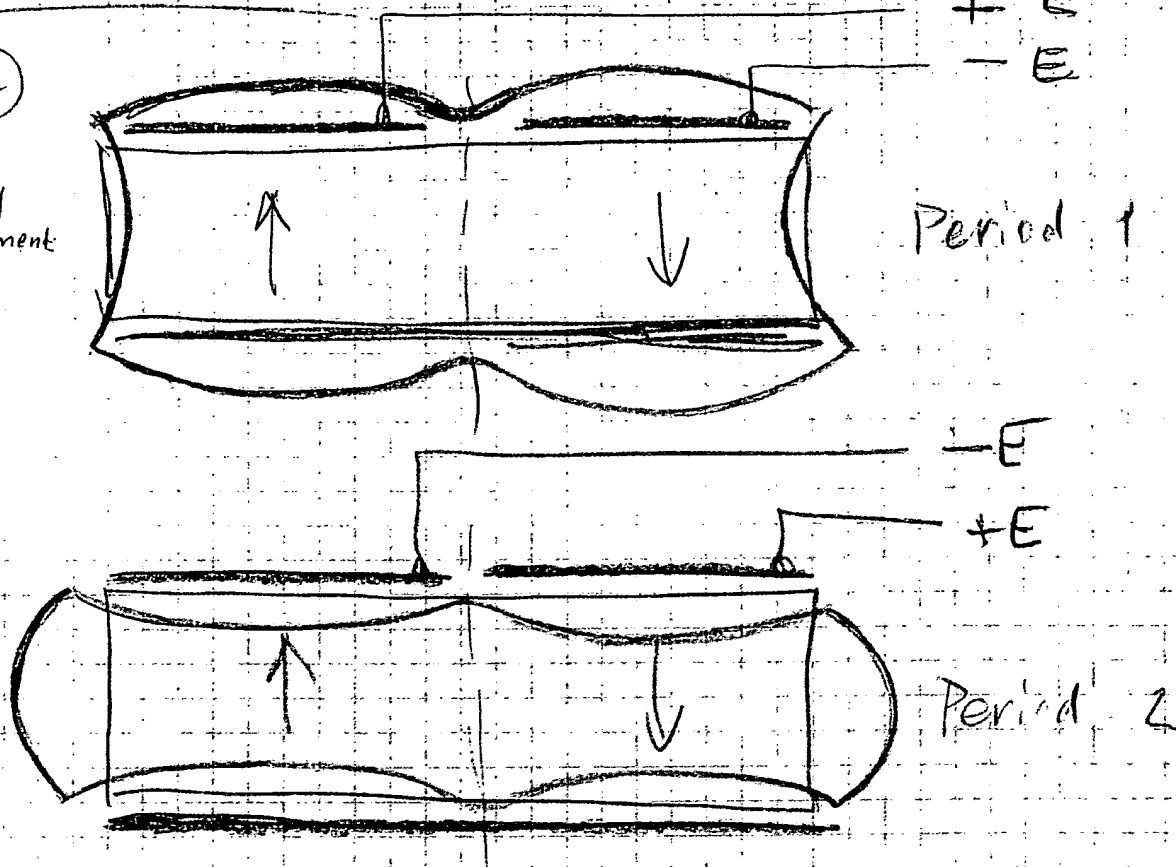
P1

P2

③ EH 0686-WO/us / Appl. no. 10/591,607 / applicant's device

①

polarization of piezoelectric element indicated by arrows



②

polarization of piezoelectric element indicated by a \oplus or \ominus

the arrows indicate the direction of the movement of the piezoelectric element when voltage is applied

